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Compressed Air Nozzles

This invention relates to a compressed air nozzle according to the features of the definition of the species of Patent Claim 1.

Compressed air nozzles are sufficiently well known from the related art, in particular for their use as blow-out guns. The blow-out guns used up to now have consisted of a system carrier, for example, which may be connected to a high pressure hose by means of a hose connection for supplying a pressurized medium. Furthermore, a manually or automatically operated outlet valve is also provided, whereby when this valve is operated, the pressurized medium flows out through an outlet nozzle or into a working machine to be activated to work. However, the systems available so far on the market, especially the blow-out guns, entail safety risks when used improperly. When blowing out a work piece without using safety goggles, eye injuries may occur due to blowback of chips and particles of dirt. Furthermore, it occurs every so often that such blowout guns are used against people either as a joke or to clean their work clothes, which thus results in painful wounds on the skin or intestinal rupture. To minimize such known accident risks, there are known air reducing valves which reduce the normal operating pressure of the compressed air supply from 6 to 10 bar down to approximately 0.5 to 1 bar, especially for hazardous areas of use, in particular for cleaning and blow-out jobs; this pressure level is usually sufficient for blowing out work pieces and is also stipulated by law in several countries. Such pressure reducing valves are connected between the blow-out gun and the high-pressure hose so that the entire device becomes rather heavy and difficult to handle. Since it is complicated and expensive to perform the pressure measurement at the point of use and therefore it is rarely done, a possibility of performing such a measurement is provided according to this invention.

The object of this invention is to improve upon a compressed air nozzle of the type defined above so that it meets the required or recommended safety standards and occupational safety regulations without having any negative effects on ease of handling and/or efficiency, without causing any additional cost or making the worker solely responsible for his or her health without easy controllability.

This object is achieved through the characterizing features of Patent Claim 1.

This invention is based essentially on the fact that the system carrier is designed to accommodate an integrated adjustable air-reducing valve. The integrated adjustable air-reducing valve permits

flexible use of the compressed air nozzle and avoids risks in compressed air systems with a high operating pressure.

In a preferred embodiment, an insert with a sealing element which together with a regulator piece which is displaceable relative to the sealing element and a regulating sleeve of the air reducing valve is inserted into the system sleeve beneath the tilt valve. The throughput of the air-reducing valve is preferably adjustable by turning or shifting the regulating sleeve within the system sleeve.

A lock nut is preferably provided for locking the regulating sleeve in the set position to lock an airflow level once it has been set.

The hose socket is preferably arranged in the upper area of the system sleeve in such a way that it cannot be released; it is preferably made of a stable and durable elastomer. A preferred use of the compressed air nozzle is for it to be designed as a blow-out and cleaning nozzle (gun).

In a preferred embodiment, the system sleeve is surrounded by an outer sleeve, whereby the lower section of the hose socket is accommodated between the system sleeve and the outer sleeve. The hose socket and the outer sleeve thus form an elastic material protection so that damage to sensitive work piece surfaces is prevented.

The hose socket preferably has a lower section for attaching to the system sleeve and a middle section with a finger rest and a finger guard for operation of the tilt valve and an upper section with a tip, which has a central outlet nozzle for the compressed medium.

In a preferred embodiment, a concentric nozzle is arranged around the central outlet nozzle, serving to produce an air shield. This air shield forms a so-called eye-protecting screen and reduces the risk of injury to the operating person due to chips and particles of dirt blown back.

The molded finger rest permits convenient metering control of the outlet valve and prevents the finger from slipping off when the operator's hands are oily or greasy. An additional flip guard is provided by the integrally molded ring flange.

In another preferred embodiment, a ring projection is provided between the central outlet nozzle and the ring nozzle, projecting beyond the tip of the hose socket and serving as protection against accidental contact. This prevents a high-pressure buildup when the tip comes in direct contact with the skin or other sensitive surfaces. The compressed air can escape at the side unhindered.

In another preferred embodiment, the ring projection and ring nozzle are designed to receive the connection of a conventional automotive tire air pressure gauge. This reduces to a few seconds the time required on the part of an operating safety person to check the pressure, making it a no-charge activity.

In a preferred refinement of this invention for which separate patent protection is claimed, the regulating piece and the regulating sleeve are designed for connection and for supporting the hose for the supply of the compressed medium to thereby gain some important advantages with regard to weight, cost and especially ease of handling.

The compressed air hose is inserted between the regulating piece and the regulating sleeve, and the resulting hose connection can be screwed into the system sleeve conveniently and in a space-saving and self-sealing manner.

In an alternative embodiment, an air-reducing valve may be omitted. A connection sleeve is inserted into the system sleeve and together with a clamping piece it serves to connect and support a compressed air hose for supplying the compressed medium. Here again, the compressed air hose is inserted between the connection sleeve and the clamping piece, thus maintaining the advantages of low weight, low cost manufacture, low space requirement, self-sealing effect and thus also improved handling.

The outlet valve is preferably designed as a tilt valve, with the hose socket enclosing the tilt valve.

The object of the present invention is derived not only from the object of the individual patent claims but also from the combination of individual patent claims with one another. All features and specifications disclosed in the documents, including the abstract, in particular the spatial design illustrated in the drawings are herewith claimed as essential to the invention in as much as they are novel with respect to the state of the art either individually or in combination.

This invention is explained in greater detail below on the basis of several drawings, which illustrate only one embodiment. Other advantages of this invention and other features that are essential to this invention are derived from the drawings and the description of the drawings, which show:

Figure 1 a longitudinal section through the compressed air nozzle in a preferred embodiment having an integrated air-reducing valve,

Figure 2 a longitudinal section through the system sleeve,

Figure 3 a longitudinal section through the insert with the sealing element,

Figure 4 a top view of the insert with the sealing element,

Figure 5 a longitudinal section through the regulating piece of the air-reducing valve,

Figure 6 a longitudinal section through the regulating sleeve of the air-reducing valve,

Figure 7 a longitudinal section through the lock nut of the air-reducing valve,

Figure 8 a side view of the valve pin of the tilt valve,

Figure 9 a longitudinal section through the connecting sleeve for the high-pressure hose for use in a second embodiment without an air-reducing valve,

Figure 10 a longitudinal section through the clamping piece used with the connection sleeve for insertion of the high pressure hose,

Figure 11 a partial sectional view through the hose socket,

Figure 11a a top view of the tip of the hose socket,

Figure 12 a side view of a preferred embodiment of the compressed air nozzle having an attached lengthening tube,

Figure 13 a longitudinal partial sectional view through another embodiment of the compressed air nozzle with the air-reducing valve opened,

Figure 14 a longitudinal partial sectional view through the compressed air nozzle according to Figure 13 with the air-reducing valve closed.

As illustrated in Figure 1, the compressed air nozzle, shown here as a blow-out gun, includes a system carrier consisting of a system sleeve 1 which accommodates or holds all the components. According to Figure 2, the system sleeve 1 consists of a lower section 2 which is provided with an inside thread 3, a middle section 4 which has a hexagon socket 5 and an upper section 6 with outer gearing 7 and/or an outer ribbing, and an outside thread is also conceivable. In the upper section 6, a passage constriction in the form of a borehole 8 is provided. A chamber into which the tilt valve 50 is inserted (see Figure 8) is formed beneath borehole 8. The valve shaft projects

through borehole 8 downstream beyond the upper section 6 of the system sleeve 1. When the valve is closed, the valve cover 51 is supported on a ring flange, which forms the borehole, thus forming a seal.

As shown in Figures 3 and 4, an insert 10 which consists of a sleeve 11, which is inserted into the system sleeve 1 with an accurate fit, is provided upstream from the tilt valve 50 (see Figure 8). A sealing element 12, which is connected to the sleeve 11 by means of ribs, which form passages, is located at the center of this insert 10. The sealing element is slightly conical, the tip of the cone pointing upstream in the direction of the hose connection.

Upstream from the sealing insert 10, a regulating piece 20 is provided and has a connection 21 for connecting a high-pressure hose 9, as well as a flange 22, which is in contact with the transition edge between the lower section 2, and the middle section 4 of the system sleeve 1. Downstream from the flange is a sealing section 23 with an O-ring seal 24, in which case the outside diameter of the sealing section 23 is selected so that it forms a seal against the inside diameter of the middle section 4 of the system sleeve 1. The regulating piece 20 is arranged in the system sleeve 1 so that it is axially displaceable and it works together with the sealing element 22 of the sealing insert 20, with a larger or smaller passage cross section remaining for the pressurized medium, depending on the axial position of the regulating piece 20, and thus the air flow rate and pressure can be regulated.

The position of the regulating piece 20 is adjusted by way of a regulating sleeve which is arranged upstream from the regulating piece 20 and has an outside thread 31 which works together with the inside thread 3 on the system sleeve 1. In this way, the regulating sleeve 30 can be screwed more or less into the system sleeve 1, which is connected to the regulating piece 20 so that the axial position of the regulating piece 20 can be adjusted by turning the regulating sleeve 30. The lock nut 40, which is shown in Figure 7 and has an inside thread 41, is located between the regulating sleeve 30 and the system sleeve 1 and can be screwed onto the outside thread 31 of the regulating sleeve 30. Once the position of the regulating sleeve 30 has been adjusted, it can be secured by the lock nut 40.

As previously indicated above, the regulating piece 20 has a connection 21 over which the high-pressure hose 9 can be pushed. The regulating sleeve also has an enlarged area 33 (see Figure 6), which is used to accommodate the bulge in the high-pressure hose 9, which is formed on insertion. After attaching the hose, the regulating piece 20 is pressed into the regulating sleeve 30

by simply screwing it in, thus forming a tight connection between the regulating piece, the regulating sleeve and the high-pressure hose 9. This integrated hose connection consisting of components 20 and 30 can be removed by simply unscrewing it from the system sleeve 1 and then can be inserted into it again by screwing it in. At the same time, this hose connection serves as a counterpart to the sealing element 12 of the air control valve. The fact that part 30 has been provided with an outside thread is also patentable per se, so that the insertion by screwing it in can be accomplished easily, quickly and can even be automated, both in the system block and in other selected compressed air tools having the same inside thread. This is thus a hose connection with an integrated air control valve, where the hose is held in the hose connection by simply inserting it there.

In another embodiment, the air-reducing valve, which is integrated into the system sleeve 1 and at the same time forms the hose connection, may be omitted. A modified form of the regulating sleeve 30, which is shown in Figure 9, and is now referred to as connection sleeve 90 serves this purpose. This connection sleeve has essentially the same features as regulating sleeve 30, but it has a much shorter length. An outside thread 92 is also provided and is designed to fit with the inside thread 3 of the system sleeve 1, and there is a flange 93 which contacts the lower end of the system sleeve. This connection sleeve 90 works together with a clamping piece 100, which has a connection 101 over which the high-pressure hose 9 can be pushed. Then the connection sleeve 90 is pushed over the connection 101 and the high pressure hose 9, with the hose being pressed between these two parts 90 and 100 and the flange 102 of the clamping piece 100 resting against the top edge of the enlarged area 91 of the connecting sleeve 90. The hose connection 90, 100 thus formed can then easily be inserted into the system sleeve 1 or into some other compressed air tool accessory lines, while at the same time guaranteeing the best anchoring with the high pressure hose.

As illustrated in Figure 1, an outer sleeve 60 which has a hexagon socket 61 which is pushed onto the hexagon insert bit 5 of the system sleeve 1 is arranged over system sleeve 1 as illustrated in Figure 1, so that the system sleeve 1 is protected by the outer sleeve 60 and the hose socket is permanently connected to the system sleeve in such a way as to form a seal.

A hose socket 70, which also overlaps with the outer sleeve 60, is pushed onto the outer gearing 7 of the upper section. The design of the hose socket 70 is illustrated in Figure 11 and 11a in particular.

The hose socket consists of a longwearing elastomer and is connected at its bottom section 71 to the system sleeve 1 as described above. In a preferred embodiment, the lower section 71 has internal gearing 72 for this purpose, ensuring a secure hold on the outer gearing 7 of the system sleeve 1 and itself being secured by the outer sleeve 60.

The hose socket 70 has a through-channel 79 into which the valve shaft 50 of the tilt valve projects approximately into the upper region of the hose socket 70, which has a finger rest 73. Through elastic deformation of the hose socket by means of pressure on the finger rest 73, the valve shaft 50 of the tilt valve is operated and flow of the pressurized medium is released, while the finger guard 88 prevents the operator's finger from slipping off or prevents injury due to movable parts of the work piece to be blasted out by the compressed air.

The pressurized medium flows through the through-channel 79 to the tip 74 of the hose socket and flows out through the central outlet nozzle 75. According to this invention, a ring nozzle 76 is arranged around the central outlet nozzle 75 so that a portion of the pressurized medium can also flow out through it. The pressurized medium flowing out of the outlet nozzle 75 preferably yields a sharp stream running axially, whereas the pressurized medium flowing out of ring nozzle 76 comes out at an outlet angle 78 and forms a so-called compressed air shield which shields the operating person from chips and particles of dirt flying back away from the work piece.

According to this invention, the area between the central nozzle 75 and the ring nozzle 76 is designed as a ring projection 77 which serves to provide protection against accidental contact, in which case when the outlet nozzle 75 is pressed against a surface, the compressed air flows completely out of the ring nozzle 76 and thus does not cause any damage on the surface. At the same time, this ring projection allows a pressure measurement to be performed on the compressed air coming out through the use of a conventional commercial automotive pneumatic pressure gauge, which is thus inexpensive.

Finally, Figure 12 shows a side view of a preferred embodiment of the compressed air nozzle and it can be seen that the outside of the blow-off gun is formed by the outer sleeve 60 and the hose socket 70 connected to it. This example also shows an extension tube 80 which may be attached to the outlet nozzle 75. The extension tube has a front outlet nozzle 81, which may be designed according to the central outlet nozzle 75. The ring nozzle 76 still functions as a compressed air shield, which is formed at an angle 78, as indicated schematically here. The

extension tube 80 is optional and is not absolutely necessary for the functioning, unless because of the risk when working with rotating work pieces (with machines in operation).

The extension tube is preferably bendable in any desired shape and may be shortened to any desired length. The outlet nozzle 81 of the lengthening tube is rubberized on the outside in a preferred embodiment or it is provided with an elastic yoke so that this also guarantees protection from scratches etc. on the work pieces to be machined.

Unless described otherwise, the parts are preferably made of a noncorroding lightweight metal, but insert 10 and tilt valve 50 as well as the outer sleeve and the hose socket with the exception of the tilt valve are preferably made of plastic.

Figures 13 and 14 illustrate one variant of the compressed air nozzle with an air-reducing valve.

As described above, the compressed air nozzle includes a system sleeve 110, which is surrounded by an outer sleeve 160, accommodating a hose socket 170 between the system sleeve 110 and the outer sleeve 160.

The integrated hose connection is also formed by a regulating piece 120 and the regulating sleeve 130 between which the hose 119 is inserted. This new type of hose connection has already been described above.

In the same way as in the first embodiment, the hose connection, consisting of the regulating piece 120 and the regulating sleeve 130, is at the same time designed as an air reducing valve which works directly together with a tilt valve 150.

The tilt valve 150 consists of a valve shaft 151 and a valve cover 152. The valve cover 152 is accommodated in the system sleeve 110 and seals its outlet opening. The valve cover 152 and/or its pressure reducing area 153 are designed with gradations in cross section approximately in the shape of a truncated cone and they are opposite the regulating piece 120 whose contact area 121 is designed according to the shape of the pressure reducing area 153 of the valve cover 152.

Figure 13 shows the air-reducing valve in an open state. The regulating piece 120 can be moved toward and away from the tilt valve 150 through the regulating sleeve 130 accommodated in a thread of the system sleeve 110 so that the valve chamber 122 is formed with a movement against the direction of flow and the compressed air can flow into it. At the same time, the valve

disk 152 comes free of its seat in the regulating piece 120, so that through lateral pressure on the valve shaft 151, the valve disk 152 has moved away from its seat in the

If the regulating sleeve 130 is moved in the direction of flow together with the regulating piece 120, valve 122 is closed, as illustrated in Figure 14, and regulating piece 120 sits on the valve disk 152. The valve is thus blocked. The tilt valve 150 can no longer be operated. It is no longer possible to open the tilt valve.

Of course all intermediate control stages and positions of the regulating piece are also conceivable, thus permitting precision control of the airflow.

The set position of the regulating sleeve 130 can be secured with a lock nut 140.

Reference numbers used in the drawings

1	System sleeve
2	Lower section
3	Inside thread
4	Middle section
5	Hexagon insert bit
6	Upper section
7	External gearing
8	Borehole
9	Compressed air hose
10	Insert
11	Sleeve
12	Sealing element
20	Regulating piece (hose connection)
21	Connection
22	Flange
23	Sealing
24	O-ring
30	Regulating sleeve (hose connection)
31	Outside thread
32	Flange
33	Enlarged area
40	Lock nut
41	Inside thread
50	Valve shaft

51	Valve cover
60	Outer sleeve
61	Hexagon socket
70	Hose socket
71	Lower section
72	Inner gearing
73	Finger rest
74	Tip
75	Outlet nozzle
76	Ring nozzle
77	Ring projection
78	Outlet angle
79	Channel
80	Extension tube (optional)
81	Outlet nozzle
82	Finger guard
90	Connection sleeve (hose connection)
91	Enlarged area
92	Outside thread
93	Flange
100	Clamping piece (hose connection)
101	Connection
102	Flange

110 System sleeve
119 Compressed air hose

120 Control piece
121 Pressure reducing area
122 Valve chamber

130 Control sleeve

140 Lock nut

150 Tilt valve
151 Valve shaft
152 Valve cover
153 Pressure reducing area

160 Outer sleeve
170 Hose socket